ALARM SWITCH

RELATED APPLICATIONS

Not applicable.

FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

MICROFICHE APPENDIX

Not applicable.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is concerned with the field of magnetic switches. In particular, the invention is concerned with a magnetic switch apparatus that detects relative movement between first and second members and defeats attempted external magnetic manipulation of the apparatus.

2. Description of the Prior Art

Prior art security alarm systems use magnetic switches attached to doors and windows and integrated with the system for detecting unauthorized opening indicating an intruder. One common type of magnetic switch is a so-called reed switch. This type of switch is subject to manipulation by an external magnet. That is, an intruder can use a magnet to hold the read switch closed (or open depending upon the control scheme) and thereby open a door or window without triggering the alarm system.

SUMMARY OF THE INVENTION

The present invention solves the prior art problem discussed above and provides a distinct advance in the state of the art. More particularly, the alarm switch hereof is configured to defeat attempts at external magnetic manipulation.

The preferred embodiment includes a rod-shaped, first switch element positioned transverse to and centrally aligned with a convex, second switch element and spaced therefrom. A ring-shaped first magnet is positioned about the first switch element and spaced from the second element in order to pull a ferromagnetic body into a switch-open position out of contact with the second switch element. These components are mounted to the first member such as a door frame. A second magnet mounted to the second member, such as the door, is positioned and magnetically sufficient to pull the body into a switch-closed position in contact with both of the switch elements when the members are in an adjacent position, that is, when the door is closed.

When the second member is moved to a separating position relative to the first member such as when the door is open, the second magnet is no longer effective to hold the body against both switch elements and the first magnet pulls the body out of contact with the second switch element to trigger the alarm system. Any use of an external magnet pulls the ferromagnetic body away from the centrally located first element thereby simulating an open door condition and triggering the alarm system. Other preferred aspects of the present invention are disclosed herein.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates preferred magnetic switch apparatus (shown in dashed lines) in accordance with the present invention and shown in use with a door frame and door;

FIG. 2 is a sectional view taken along lines 2—2 of FIG. 1 and also showing an intruder magnet;

FIG. 3 is a schematic illustration of the preferred alarm system using the apparatus of FIG. 1 in accordance with the present invention; and

FIG. 4 is a top front pictorial view of the preferred magnet switch assembly of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 illustrates preferred magnetic switch apparatus **10** (dashed lines) in accordance with the present invention shown in use with a door frame **12** and door **14**. FIG. 2 more clearly illustrates the details of apparatus **10** which broadly includes switch assembly **16** and operating magnet **18**.

Switch assembly **16** includes first switch element **20**, second switch element **22**, a ferromagnetic body in the form of ball **24**, retraction magnet **26** and electrically insulating upper wall **28**. First switch element **20** has a generally rod-shaped configuration and presents lower end **30** and upper end **32** with flange **34** therebetween nearest upper end **32**. Element **20** is preferably composed of metal to be electrically conductive.

Electrically conductive, second switch element **22** is integrally formed of sheet metal such as by stamping and includes disk-shaped bottom wall **36** presenting contact surface **38** and further includes side wall **40** circumscribing bottom wall **36**. As illustrated in FIG. **2**, bottom wall **36** is shaped so that contact surface **38** presents a convex configuration and in particular, a reversed, conically shaped configuration.

Upper wall **28** is preferably composed of glass (or other insulating material) and electrically insulates switch elements **20, 22** from one another. Upper wall **28** is spaced from contact surface **38** and is circumscribed by side wall **40**. The outboard face of upper wall **28** is flush with the upper edge of side wall **40**.

Upper wall **28** also includes central opening **42** defined therein for receiving the lower portion of first switch element **20** with flange **34** thereof engaging the outboard face of upper wall **28**. This positions first switch element **20** in alignment with the axis of contact surface **38** and spaces lower end **30** from contact surface **38**.

Upper wall **28**, bottom wall **36** and side wall **40** define switch chamber **44** with ferromagnetic ball **24** contained therein. As will be appreciated, ball **24** is electrically conductive and can be configured in other shapes such as a cube or cylinder, although the spherical shape is preferred.

Ball **24** is shiftable within chamber **44** between a switch-open position and a switch-closed position. In the switch-open position, ball **24** is not in contact with both switch elements **20, 22**. Such a position is illustrated by the dashed lines in FIG. **2** wherein ball **24** is in contact with only one of the switch elements, namely first switch element **20**. The switch-open position can occur also if ball **24** shifts along contact surface **38** toward side wall **40** and out of contact with switch element **20**. The switch-closed position is illustrated by the solid lines in FIG. **2** in which ball **24** is in contact with both switch elements **20, 22**.

Retraction magnet **26** presents a ring-shaped configuration in the nature of a torus and is positioned adjacent the outboard face of upper wall **28** surrounding flange **34** and thereby in surrounding relationship with first switch element **20**. This arrangement positions magnet **18** spaced from contact surface **38**. The magnetic field strength of magnet **26**

is sufficient to shift ball **24** to the switch-open position illustrated in FIG. **2** in the absence of other magnetic effects such as that of operating magnet **18** discussed further herein. It will be appreciated that magnet **26** can take other shapes such as a rod, cylinder or ball or any other shape that would fit above the switch unit and serve to shift ball **24**.

In use, switch assembly **16** is installed in door frame **12** and operating magnet **18** is installed in door **14** as illustrated in FIGS. **1** and **2**. With door **14** closed, frame **12** and door **14** are in an adjacent position with operating magnet **18** aligned with switch assembly **16**. Magnet **18** presents sufficient field strength to shift ball **24** to the switch-closed position.

When door **14** is open, door frame **12** and door **14** are in a separated position and operating magnet **18** is no longer aligned with switch assembly **16**. This allows retraction magnet **26** to shift ball **24** to the switch-open position.

FIG. **2** also illustrates intruder magnet **46** positioned adjacent the side of switch assembly **16**. Placement of intruder magnet **46** as shown causes ball **24** to shift along contact surface **38** toward side wall **40** in the direction of intruder magnet **46**. This is also a switch-open position and simulates the opening of door **14**. Thus, the use of an intruder magnet results in an alarm condition because of the structure of switch assembly **16**. In this way, apparatus **10** defeats the use of an intruder magnet which has been a problem with the prior art.

FIG. **3** is a schematic illustration of the preferred alarm **48** system using preferred apparatus **10**. System **48** includes conventional alarm control **50** and an alarm output such as alarm bell **52**. Apparatus **10** is used in system **48** as a contact switch triggering alarm control **50** whenever apparatus **10** is in the switch-open position, unless system **48** has been disarmed.

Having thus disclosed the preferred embodiment of the present invention, the following is claimed as new and desired to be secured by Letters Patent:

1. A magnetic switch apparatus for detecting relative movement between first and second members, said apparatus comprising:

a switch assembly for mounting to the first member, said assembly including

a first switch element presenting a generally rod-shaped configuration,

a second switch element presenting a generally disc-shaped configuration and having a contact surface,

structure positioning said first switch element generally transverse to said contact surface and spaced therefrom,

a ferromagnetic body shiftable between a switch-open position in which said body is out of contact with both of said first and second elements and a switch-closed position in which said body is in electrical contact with both said element and said contact surface; and

a first magnet spaced from said contact surface and positioned for magnetically shifting said body to said switch-open position; and

a second magnet for mounting to the second member and positioned on an opposed side of said contact surface relative to said first switch element, said second magnet being magnetically sufficient for shifting said body to said switch-closed position when the members are in an adjacent position, and for allowing said first magnet to shift said body to said switch-open position when the members are separated.

2. The apparatus as set forth in claim **1**, said contact surface presenting a generally convex configuration relative to said first switch element.

3. The apparatus as set forth in claim **2**, said contact surface presenting a generally reversed conically shaped configuration.

4. The apparatus as set forth in claim **1**, said contact surface presenting a central axis with said first switch contact generally aligned with said axis.

5. The apparatus as set forth in claim **1**, said second switch element including a side wall circumscribing said contact surface as a bottom wall.

6. The apparatus as set forth in claim **5**, said second switch element being integrally formed of metal.

7. The apparatus as set forth in claim **6**, said switch assembly including an electrically insulating top wall spaced from said contact surface and circumscribed by said bottom wall to define a switching chamber containing said body.

8. The apparatus as set forth in claim **7**, said first switch element including an extended portion extending outwardly through said top wall.

9. The apparatus as set forth in claim **8**, said first magnet being ring-shaped and positioned adjacent said top wall and surrounding said extended portion.

10. The apparatus as set forth in claim **9**, said body presenting a generally spherical configuration.

11. The apparatus as set forth in claim **1**, said body presenting a generally spherical configuration.

12. The apparatus as set forth in claim **1**, said switch-open position being an electrically open switch position, said switch-closed position being an electrically closed switch position.

13. The apparatus as set forth in claim **1**, said switch elements being located so that said body shifts to a switch-open position when the members are in the adjacent position and when an external magnet is applied in the vicinity of the first member in an attempt to manipulate magnetically said apparatus.

14. A magnetic switch apparatus for detecting relative movement between first and second members, said apparatus comprising:

a switch assembly for mounting to the first member, said assembly including

a first switch element presenting a generally rod-shaped configuration,

a second switch element presenting a generally disc-shaped configuration and having a convex contact surface presenting a central axis

an electrically insulating top wall spaced from said contact surface, centrally receiving an extension portion of said first switch element therethrough, and positioning said first switch element generally aligned with said axis of said contact surface and spaced therefrom,

a ferromagnetic ball shiftable between a switch-open position in which said body is out of contact with both of said elements and a switch-closed position in which said body is in electrical contact with both said element and said contact surface, said switch-open position being an electrically open switch position, said switch-closed position being an electrically closed switch position, and

a ring-shaped, first magnet surrounding said extension portion and positioned for magnetically shifting said body to said switch-open position; and

a second magnet for mounting to the second member and positioned on an opposed side of said contact surface relative to said first switch element, said second magnet being sufficient magnetically for shifting said body to said switch-closed position when the members are in an

adjacent position, and for allowing said first magnet to shift said body to said switch-open position when the members are separated.

15. An alarm system for activating an alarm upon shifting of first and second members from an adjacent position to a separated position and upon attempted manipulation by an external magnet of the alarm system when the members are in the adjacent position, said system comprising:

a switch apparatus; and

an alarm control coupled with said switch apparatus and responsive to a change in state thereof for activating an alarm, said switch apparatus including

a switch assembly for mounting to the first member, said assembly including

a first switch element presenting a generally rod-shaped configuration,

a second switch element presenting a generally disc-shaped configuration and having a contact surface,

structure positioning said first switch element generally transverse to said contact surface and spaced therefrom,

a ferromagnetic body shiftable between a switch-open position in which said body is out of contact with both of said elements and a switch-closed position in which said body is in electrical contact with both said element and said contact surface,

a first magnet spaced from said contact surface and positioned for magnetically shifting said body to said switch-open position,

a second magnet for mounting to the second member and positioned on an opposed side of said contact surface relative to said first switch element, said second magnet being sufficient magnetically for shifting said body to said switch-closed position when the members are in an adjacent position, and for allowing said first magnet to shift said body to said switch-open position when the members are separated,

said switch elements being located so that said body shifts to a switch-open position when the members are in the adjacent position and when an external magnet is applied in the vicinity of the first member in an attempt to manipulate magnetically said apparatus.

* * * * *